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ABSTRACT

This paper addresses the issue of future educational technology and where community colleges will position themselves in this new world of learning. In December of 2000, the U.S. Department of Education's Web-Based Education Commission issued its final report, "The Power of the Internet for Learning: Moving from Promise to Practice." The report called on the new Congress and the incoming Bush administration to "embrace an 'e-learning' agenda as the centerpiece of our nation's federal education policy." Online courses at colleges and universities have, however, given rise to questions about quality control, transferability, territorial imperatives, and similar issues. This leads to the issue of establishing standards in computer-based instruction. The author, in addressing this concern, discusses learning objects, which can take the place of text materials in the form of text, audio, visual, graphics, or any combination of the above. Ideally, the learning objects are accessible, adaptable, interoperable, reliable, reusable, durable, and affordable. The learning object must also have a metadata tag that supplies information for classifying and locating the item. In addition, learning objects must be created in such a way that they interact appropriately with any Learner Management System. (NB)

THE LEARNING OBJECT ECONOMY: WILL YOUR COLLEGE BE READY?

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Interim Director of Community College Relations
The College Board

THE LEARNING OBJECT ECONOMY: WILL YOUR COLLEGE BE READY?

Matt sits on a bench in the central patio of his campus using his laptop to access the college network through a nearby wireless transmitter. He is struggling with a problem in differential equations, and his personal learning associate has just routed him into an individualized learning activity with plenty of visuals to suit his learning style. Noelia connects to her personal learning associate through a handheld organizer with wireless internet access while she waits for her evening commuter train. She picks up just where she left off at lunch on an exercise about formatting small business financial plans. Both the plan and her ability to obtain financing for the actual business venture will count toward a business degree at a university 2000 miles away. Naim in Indiana and Moira in Ireland are cyberspace lab partners working interactively in real time to complete a simulated organic chemistry experiment. While sitting in his dentist's waiting room, Jim finishes a certification test for a networking module he is studying, receives a passing score and submits the information to be recorded in his life studies portfolio. This file is kept in a national data bank and documents all degrees, certificates and other training Jim has completed; employers and others he authorizes can access the portfolio.

A new world of learning

This is the brave new world of learning, perhaps best described by J. D. Fletcher and Philip Dodds (2000) in a recent article for the American Society for Training and Development:

> We envision a future in which everyone will have an electronic personal learning associate. This device will be able to assemble learning or mentor presentations on demand and in real time--any time, anywhere. The presentations will be tailored to the needs, capabilities, intentions, and learning state of each individual or group (for example, crew, team, or staff) of individuals. Communication with the device will be based on natural language dialogue initiated by the device or by its users. The device will be portable, perhaps small enough to be carried in a shirt pocket.

The technology to produce such devices is available now and grows more sophisticated and capable with each new generation of gadgets. The instructional content is also available but largely inaccessible--it can't be located easily, transported across platforms and systems, or readily broken down into mix-and-match "chunks." Further, when instructional content is created in one Learner Management System (ex. Blackboard, WebCT), the learning object or "chunk" may not mesh well with the assessment and student tracking components of another system.

Will community colleges be players in this new world of learning? At this point, the question seems to be not whether they will be players, but in what way and how soon. As a matter of survival, our colleges must transform themselves into providers of twenty-first century learning experiences and, as a matter of smart business, they must take advantage of the efficiencies that come from using technology to deliver instruction. The growing body of research on the effectiveness of technology-supported instruction reflects higher student achievement and greater efficiency in delivering instruction at lower cost when these tools are employed. Based on research findings, Fletcher and Dodds assume a rule of "thirds" in which "the use of these...(advanced learning technologies) reduces the cost of instruction by about one-third and it either reduces the time of instruction by about one-third or it increases the amount of skills and knowledge acquired by about one-third." These are compelling findings as community colleges continue to struggle with limited human and financial resources.

The pressure to move into this new world comes from a variety of other sources as well. First, shortly before the Bush administration took office, the U. S. Department of Education Web-Based Education Commission issued its final report, *The Power of the Internet for Learning: Moving from Promise to Practice* (December 2000), calling on the new Congress and administration "to embrace an 'e-learning' agenda as the centerpiece of our nation's federal education policy." The Commission's call to action included making the Internet accessible to

all learners, providing continuous and relevant professional development for educators, researching how people learn in the Internet Age, developing high quality content that meets standards of excellence, revising outdated regulations, protecting the privacy of online learners, and providing funding. It is likely that the new administration will support these proposals. Second, EDUCAUSE, the leading organization drawing together educational institutions and high technology companies, has established a National Learning Infrastructure Initiative (NLII) with a mission "to create new collegiate learning environments that harness the power of information technology to improve the quality of teaching and learning, contain or reduce rising costs, and provide greater access to higher education." The NLII seeks to create an entirely new learning environment, not simply "changes at the margins" (Olsen, 2001). Third, and perhaps most compelling of all, students who arrive at community college doors are increasingly sophisticated as a result of advances in K-12 schools due to federal support for technology or because of skills gained at their workplace. These students expect state-of-the-art equipment and far more advanced learning experiences and, as consumers, they will take their business elsewhere if colleges fail to meet their expectations.

Learning objects

Colleges all over the world now offer online instruction, and many faculty are incorporating technological components in site-bound courses as well—ranging from simple e-mail communications between professors and students to threaded discussions, advanced simulations and manipulation of massive data sets available over the Internet. While these developments give some sense of forward movement, in the case of online courses they have also led to much reinventing of the wheel and significant questions about quality control, tranferability, territorial imperatives and similar issues. Further, faculty are at varying levels of motivation and skill regarding new technologies and the associated forms of instructional design

at the same time that there is great pressure to update traditional courses for Information Age students.

Fortunately, there is a move to bring order to all this instructional ferment. The U. S. Department of Defense, the Institute for Electrical and Electronics Engineers (IEEE), major software vendors, higher education institutions and the aviation industry, among others, have begun to address the need for standards in computer-based instruction. Over the past several years, these groups have focused on learning objects—small chunks of content—as the fundamental element of instruction. If one were to think of degrees as molecules and courses as atoms, learning objects would be the subatomic particles that are the basic building blocks of instructional matter.

These learning objects take many forms. They can be text materials such as lectures and readings; audio and video clips; simulations; graphics such as tables, slides and animations, or combinations of these. They vary in length and may cover a single concept or process or a small cluster of related items. Ideally, learning objects are:

- Accessible - easy to locate, search, update and manipulate
- Adaptable - able to be combined in various ways to personalize content for individuals or groups and address their competency needs
- Interoperable - usable with many systems and platforms
- Reliable - performing consistently regardless of the system or platform
- Reusable - able to be used numerous times, adding value with each reuse
- Durable and affordable (Fletcher & Dodds, 2000)

Creating learning objects is only half the job, however. To be truly accessible, each learning object must carry with it a label—a metadata tag—that supplies important information for classifying and locating the item. The metadata tag functions in a manner similar to the old Dewey decimal system or card catalog in libraries of the past. It is attached to the learning

object as computer code and contains descriptors for the specific content, format, length, level, author, interactivity, language, cost and so on. Search engines will refer to these tags when seeking learning objects of a specific type. The prime mover in metadata specifications has been the IMS Global Learning Consortium, a private nonprofit corporation that was created originally by EDUCAUSE. Working with some of the groups mentioned earlier, the IMS project has settled on a programming language (XLM) and specified core metadata fields (See IMS website). In June 2000, IMS released Metadata Specifications Version 1.1 to the public. Of course, once there is agreement from all parties on these specifications, the real challenge will be to label all learning objects and courses, a monumental coding job (Gnagni, 2001).

Finally, learning objects must be created in such a way that they interact appropriately with any Learner Management System. In other words, in any LMS it must be possible not only to teach the content, but also to assess the student's grasp of that content and to track and record the student's performance.

Taking it to the next level

William Longmire (2000) addresses the packaging of learning objects into courses or other instructional contexts in another ASTD article. To be portable, combinable and reusable, learning objects must:

- be free-standing and non-sequential, preferably addressing a single learning objective
- avoid specific reference to previous or subsequent materials
- use consistent language and tone
- present material in a format best suited for onscreen consumption
- incorporate keywords to aid searches
- keep content appropriate for a broad audience

Designers of learning objects must have a sort of "double vision" that conceptualizes "content as part of a larger whole (such as a course) and as stand-alone information at the desired level of

granularity." The instructional facilitator, in turn, identifies appropriate learning objects, organizes these content chunks within a course framework, delivers the instruction and helps to contextualize the information so that the learner can give meaning to and use what is learned. The learning facilitator is also responsible for student tracking, assessing and documenting the extent of learning. In the new world of learning, the learning facilitator may be a faculty member, a computer-based personal learning associate, a software or textbook producer, an employer or even the learner him/herself.

The Advanced Distributed Learning Initiative and SCORM

Because the U. S. Department of Defense must ensure that military personnel are able to respond instantly to threats anywhere in the world, the DOD has emerged as a leader in the movement to create and use learning objects. In the face of bio-chemical warfare, terrorism, futuristic war machinery and similar challenges, America's fighting forces must be trained and retrained continually wherever they may be located. There is no time to search through and adapt the multitudes of courses and modules offered by providers that each use different formats and platforms, nor is there time to develop learning systems that are unique to the military. The Advanced Distributed Learning Initiative (ADL), then, is a priority in the DOD's strategic plan to "provide access to the highest quality education and training, tailored to individual needs, delivered cost effectively, anywhere and anytime."

Launched in November 1997 by the DOD and the White House Office of Science and Technology Policy, the ADL initiative has focused on developing an open architecture for online learning in cooperation with government agencies, 1,600 colleges and universities and 150 corporations. In a Fall 2000 presentation to the AACC Commission on Communication and Learning Technologies, R. Tom Goodden, Director of Institutional Learning for the Office of the Under Secretary of Defense (Readiness), outlined the following strategies for the ADL effort:

- Exploit existing network-based technologies

- Create platform-neutral, reusable courseware and content to lower costs
- Promote widespread collaboration to satisfy common needs
- Enhance performance with emerging and next-generation learning technologies
- Develop a common framework that drives product cycle
- Establish a coordinated implementation process

The key to this work is a set of guidelines or standards with the unlikely name of SCORM—the Shareable Courseware Objects Reference Model. In collaboration with many of the key players mentioned above, the DOD has developed SCORM in order to define the interrelated specifications of a web-based learning "content model" that meets the criteria listed by Fletcher and Dodds. Rather than replacing other models, SCORM will serve as a kind of umbrella under which other models can fit and become shareable across systems. To that end, much has been accomplished already and Version 1.1 is now in circulation. Eventually it is expected that SCORM will become LARM—the Learning Architecture Reference Model—addressing next generation technologies and then the model will be handed off to industry and commercialized.

If SCORM is to become the standard, of course, a wide variety of stakeholders must buy in. The need to update equipment and replace software continually is certainly an argument in favor of common standards that reduce such expenditures. Instructional content is expensive to create and may be more highly valued if it is durable and reusable. There are other incentives as well: businesses that need to train their employees see the benefits of Department of Defense leadership and financing for this monumental instructional development effort. Software developers may find no market if their products fail to conform to the commonly accepted standards. Since in late 2001 SCORM will become the mandated standard for developing courseware used by the DOD, educational institutions that do not use the model could lose military contracts to other providers. As Neal Nored, vice president of product development at

Blackboard, Inc. observed recently in a *Chronicle of Higher Education* article (Carr, January 29, 2001): "The people who don't play well with others and share their toys are going to be left out in the cold."

The ADL CoLabs

To support the creation of an object-oriented learning environment that will serve the training needs of U. S. armed forces, the DOD has established three ADL Co-Labs to encourage development of shareable courseware, test courseware conformance to SCORM, assess the costs and effectiveness of different approaches to technology-based learning and act as clearinghouses for the ADL effort. These Co-Labs—located in Orlando (FL), Madison (WI) and Arlington (VA)—are staffed with core management and technical teams and provide space for visiting project managers.

This year the Co-Labs sponsored a series of "Plugfests" during which participants from the private and public sectors could learn about SCORM and test their software against the reference model. In another ADL activity, six "Rapid Start" prototype projects were selected to begin converting and/or tagging existing instructional materials using the SCORM format. Ten additional prototypes have been funded for FY01 and in August 2001 a call for new proposals will be issued (See ADL website). Most of the current projects are being conducted by military agencies, but future rounds could involve educational institutions as well. There are many opportunities here for colleges and universities since, in addition to developing new learning materials, more than 30,000 courses offered through the DOD must be converted and tagged. There are plans to convert ten percent of these courses annually over the next five years, but that leaves half the total number yet to be addressed.

Finally, an ADL Certification Program is under development. Organizations that successfully complete the program will be able to represent themselves and their products as ADL certified by displaying a special logo. Initially, ADL Auditors will be trained to conduct the

certification process and eventually there will be a registry of Certified Content Developers, Certification Organizations and Auditor Training and Testing Organizations. The certification program will provide community colleges with a variety of options for involvement as well.

Soldiers and Sailors Go to College

While the monumental work of moving to an object-centered learning system goes forward, the Department of Defense must continue training today's armed forces and they consider community colleges to be key partners in this effort. Tom Goodden comments:

> "Wherever one of our specific education or training needs corresponds highly with courseware already developed for academic markets, we should send our students (virtually) to those institutions and then supplement as necessary. I believe that for most technical subjects, the accredited academic institutions can deliver the 75-90% solution to our needs. The benefit to us is that credit toward degrees comes with the learning and the market place assures that we receive up-to-date instruction. This could be a powerful alliance with civilian educators and a very large market (for community colleges)."

Under a $453 million contract awarded to PricewaterhouseCoopers in December 2000, the Army is launching Army University Access on Line, a new educational venture that will serve 80,000 soldiers over the next five years. PricewaterhouseCoopers will act as the "integrator" for an impressive group of corporate and academic partners, including Blackboard, People Soft and Compaq, as well as Ann Arundel Community College (MD), Northern Virginia Community College, Rio Salado College (AZ) and Lansing Community College (MI). Students will be provided with laptops and Internet connections and the first courses will be offered at three Army bases in spring 2001 (Carr, January 5, 2001). The project includes an educational web portal, www.eArmyU.com, which will provide services such as e-mail, 24/7 tutoring, skills assessment tests, interactive checklists, career and educational planning, personalized degree maps with

"what if" scenarios, and a help desk. Students will also be able to register for courses, order course materials, search and customize the portal.

In January 2001, the Navy established a pilot project to offer full degree programs to sailors around the world, partly as an aid to recruitment and retention. Rather than providing instruction, the Navy will work directly with 16 colleges and universities, including Coastline Community College (CA), the Dallas Community College District and Florida Community College in Jacksonville. Other providers will be selected in the coming year. Once the Navy has approved a college's programs, sailors may enroll in distance learning courses leading toward a degree from that institution. Since some personnel on submarines or aircraft carriers may not have access to the Internet, the same courses must also be available through video and print materials (Carr, November 2000).

Clearly, educating the armed forces is good business. Not only do colleges that respond to the call gain students, but often they can also access resources to help improve their programs for all students. Moreover, when the SCORM becomes the mandated standard for the DOD later this year, institutions that have begun to work within a learning-object framework will have the advantage. As the DOD struggles with replacement or conversion of its 30,000 traditional courses, colleges that can provide new, state-of-the-art instruction in learning-object "chunks" will be in prime position for partnerships.

Sticky issues

As exciting as this new approach to presenting knowledge may sound, there are concerns that come to mind, particularly about the human dimensions of learning in the future. Until now, the personal interaction between teacher and learner has been at the heart of any instructional activity. The teacher designs a lesson or course with reference to the characteristics of the learners involved, carries out that design in the classroom, changes and adapts activities in response to student needs and evaluates the results of student work. What happens when an

instructional designer creates bits and pieces of lessons/courses seated at a computer hundreds or thousands of miles away from the unknown student and then those "chunks" are combined into a package of learning experiences by a facilitator that may not even be human? In fact, could not a computer present the learner with any number of combinations of learning objects, learning tracks that the student (or a personal learning associate) could cobble together without even using a facilitator? Where, then, is the mentoring and personal attention faculty have always provided their students? Will the teacher's expert judgment about a learner's interaction with both the material and other learners no longer be part of assessing learning? How can the qualitative "overtones" of learning be measured—the unexpected connections and discoveries, the changes in life perspective, the aesthetic pleasures that students often demonstrate to their teachers while learning?

Then there are the issues of documenting what is learned in this new world, a topic of considerable discussion at the moment. Will a lifetime record of learning look like a mosaic where the tiny pieces are more noticeable than the whole picture they form? Will we define the educated person as the sum total of all the learning objects he or she completes? What kinds of milestones and credentials will appear on the lifetime record to bring order to all the learning "chunks" a student may undertake, and who will be the keeper of the record?

Probably the future of learning lies somewhere in the middle ground between the personally joyful but inefficient educational traditions of the past and the high-tech low-touch extremes reflected in these speculations. Those who are troubled by the apparent depersonalization of learning as a result of new technologies may take comfort in the fact that students have always sought out knowledgeable people to guide their learning and teachers have always managed to incorporate new techniques while still keeping the learning process personal. Neither group is likely to change in this regard. And, contrary to the expectations of

some, rather than isolating individuals, the computer has drawn people into new communities for learning and work.

What Community Colleges Can Do

Community colleges have already assumed leadership as developers and providers of technology-mediated instruction, both online and on-site. They have worked diligently with software companies to continually improve the Learner Management Systems and course templates that now dominate the enterprise, and they have created effective systems for offering student support services to those engaged in distributed learning. In the movement to a web-based, object-centered learning environment, community colleges that expect to continue playing a leadership role should:

- Take part in the dialogue on the nature of learning in the digital age and the best means to utilize emerging technologies to promote learning
- Develop an organizational strategy that maximizes distributed learning capabilities
- Engage faculty in the transition to an object-centered learning environment by supporting training, instructional design and classroom research
- Recognize that commonly accepted standards are essential for knowledge to be truly usable and shareable
- Design learning content in small, logical "chunks" with sharing and reuse in mind
- Inform vendors that standards-based products will be priority purchases
- Become involved in the ADL/SCORM process and take advantage of current research and resources to improve instruction
- Become ADL Certification and Auditor Training Organizations and encourage faculty to be certified content developers
- Help shape public policy at the local, state and national levels during this period when learning is being reinvented for the future.

The move to a learning object economy presents community colleges with an unparalleled opportunity to step to the forefront in the age of digital learning. With their historic emphasis on learning, teaching and student success, they have only to accept the challenge of applying these enduring values to the new world of learning that is before us.

(Insert boxes where appropriate in the article)

Studies have shown that the use of ADL technology-based instruction reduces the cost of instruction by 30-60%; reduces time of instruction by 20-40%; increases effectiveness of instruction by 30%; increases student knowledge and performance by 10-30%; and improves organization efficiency and productivity. ADL also improves costs and efficiencies by distributing instructional components inexpensively to physically remote locations and simulating expensive devices for both operator and maintenance training.

www.adlnet.org/ourstory/ourstory.cfm

WEBSITES TO VISIT

For additional information and resources on distributed learning, these websites are of interest:

www.adlnet.org	Department of Defense Advanced Distributed Learning Initiative
www.imsproject.org	IMS Global Learning Consortium, Inc.
www.educause.edu	EDUCAUSE
www.learningcircuits.com	American Society for Training and Development online journal
www.itcnetwork.org	AACC-Affiliated Instructional Technology Council
www.hpcnet.org	U.S. Department of Education Web-Based Education Commission
www.eArmyU.com	U. S. Army online learning portal

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Curriculum Design in the Form of Learning Objects

Presenters

- Leila Gonzalez Sullivan
  Interim Director of Community College Relations, The College Board
- Douglas Hamilton
  Project Director, Academic ADL Co-Lab, University of Wisconsin
- Kathleen Sigler
  President, Miami Dade Community College Medical Campus

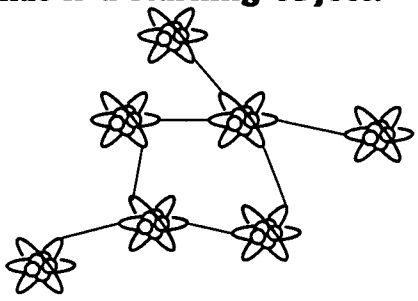
Agenda

- What is a learning object and how does it work in curriculum design?
- Why should learning objects be standardized?
- How do they work in a real-life college setting?
- Next steps?

What is a learning object and how does it work in curriculum design?

Leila Gonzalez Sullivan
Interim Director of Community College Relations, The College Board

What is a learning object?



What is a learning object?

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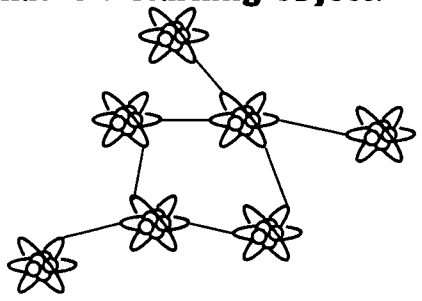

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Definition

- Small "chunk" of instructional content
- Covers a single concept, process or cluster of related items
- Addresses a single learning objective
- Is self-contained

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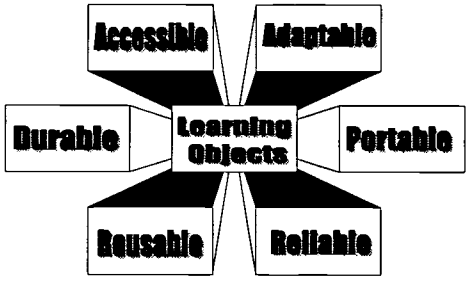
Characteristics



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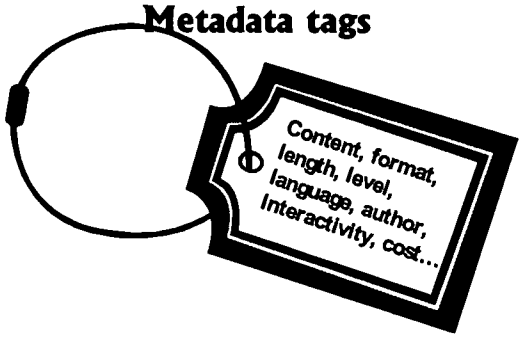
Metadata tags



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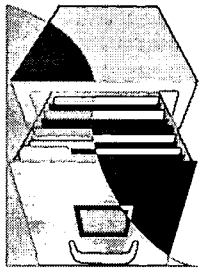
Learner Management



- ✓Tracking
- ✓Assessing
- ✓Documenting

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Creating learning objectives

- Address a single learning objective
- BUT see content as part of larger whole
- Avoid reference to previous or subsequent materials

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Creating learning objectives

- Design content for broad audience
- Incorporate keywords
- Use consistent language, tone
- Choose format suited for onscreen

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Why should learning objects be standardized?

Douglas Hamilton
Project Director, Academic ADL Co-Lab,
University of Wisconsin

How do they work in real life?

Kathleen Sigler
President, Miami Dade Community College
Medical Campus

Thank you!

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